FIG. 1

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MOTE 6A: SENSING INDEX — 204

Light Device	Light Device Information Available	Query Command Format	Output Format
Electrical/Magnetic Device	Electrical/Magnetic Device Information Available	Query Command Format	Output Format
Pressure Device	Pressure Device Information Available	Query Command Format	Output Format
Temperature Device	Temperature Device Information Available	Query Command Format	Output Format
Volume Device	Volume Device Information Available	Query Command Format	Output Format
Inertial Device	Inertial Device Information Available	Query Command Format	Output Format
Antenna	Antenna Information Available	Query Command Format	Output Format

MOTE 6A: CONTROL INDEX — 206

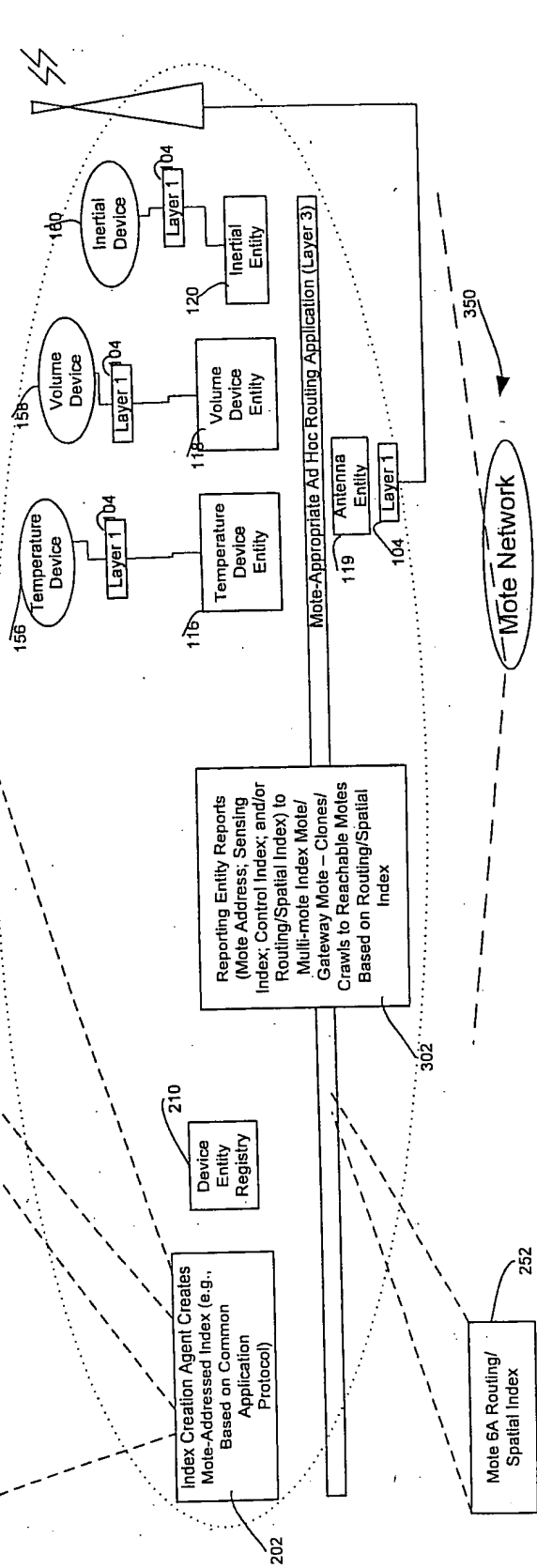| Light Device	Light Device Commands Available	Control Command Format	Feedback Format
Electrical/Magnetic Device	Electrical/Magnetic Device Commands Available	Control Command Format	Feedback Format
Pressure Device	Pressure Device Commands Available	Control Command Format	Feedback Format
Temperature Device	Temperature Device Commands Available	Control Command Format	Feedback Format
Volume Device	Volume Device Commands Available	Control Command Format	Feedback Format
Inertial Device	Inertial Device Commands Available	Control Command Format	Feedback Format
Antenna	Antenna Commands Available	Control Command Format	Feedback Format

200

102

Inertial Device 160 — Layer 1 104

Volume Device 158 — Layer 1 104

Temperature Device 156 — Layer 1 104

Pressure Device 144 — Layer 1 104

Electrical/Magnetic Device 142 — Layer 1 104

Light Device 140 — Layer 1 104

Inertial Entity 120

Volume Device Entity 118

Temperature Device Entity 116

Pressure Device Entity 114

Electrical/Magnetic Device Entity 112

Light Device Entity 110

Antenna Entity 119 — Layer 1 104

Index Creation Agent Creates Mote-Addressed Index (e.g., Based on Common Application Protocol) 202

Device Entity Registry 210

Mote-Appropriate Ad Hoc Routing Application (Layer 3)

Mote 6A Routing/Spatial Index 252

FIG. 2

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FIG. 3
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MOTE 6A: SENSING INDEX (204)

	Information Available	Query Command Format	Output Format
Light Device	Light Device Information Available	Query Command Format	Output Format
Electrical/Magnetic Device	Electrical/Magnetic Device Information Available	Query Command Format	Output Format
Pressure Device	Pressure Device Information Available	Query Command Format	Output Format
Temperature Device	Temperature Device Information Available	Query Command Format	Output Format
Volume Device	Volume Device Information Available	Query Command Format	Output Format
Inertial Device	Inertial Device Information Available	Query Command Format	Output Format
Antenna	Antenna Information Available	Query Command Format	Output Format

MOTE 6A: CONTROL INDEX (206)

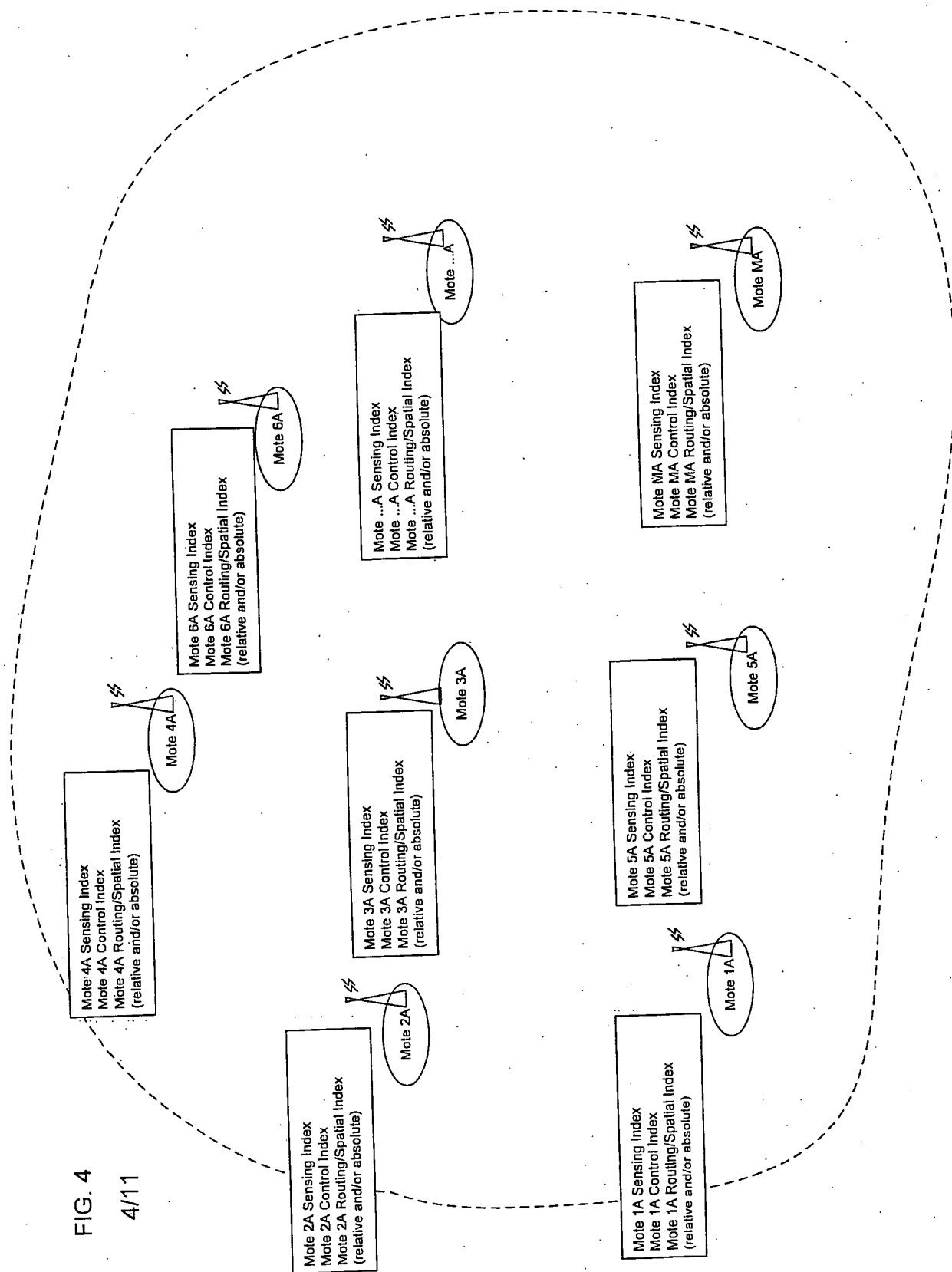|	Commands Available	Control Command Format	Feedback Format
Light Sensor	Light Device Commands Available	Control Command Format	Feedback Format
Electrical/Magnetic Device	Electrical/Magnetic Device Commands Available	Control Command Format	Feedback Format
Pressure Device	Pressure Device Commands Available	Control Command Format	Feedback Format
Temperature Device	Temperature Device Commands Available	Control Command Format	Feedback Format
Volume Device	Volume Device Commands Available	Control Command Format	Feedback Format
Inertial Device	Inertial Device Commands Available	Control Command Format	Feedback Format
Antenna	Antenna Commands Available	Control Command Format	Feedback Format

102

Inertial Device (160) — Layer 1 (104) — Inertial Entity (120)

Volume Device (158) — Layer 1 (104) — Volume Device Entity (118)

Temperature Device (156) — Layer 1 (104) — Temperature Device Entity (116)

Mote-Appropriate Ad Hoc Routing Application (Layer 3)

Antenna Entity (119) — Layer 1 (104)

350

Mote Network

Reporting Entity Reports (Mote Address; Sensing Index; Control Index; and/or Routing/Spatial Index) to Multi-mote Index Mote/ Gateway Mote – Clones/ Crawls to Reachable Motes Based on Routing/Spatial Index (302)

Device Entity Registry (210)

Index Creation Agent Creates Mote-Addressed Index (e.g., Based on Common Application Protocol) (202)

Mote 6A Routing/ Spatial Index (252)

FIG. 4

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Mote 4A Sensing Index
Mote 4A Control Index
Mote 4A Routing/Spatial Index
(relative and/or absolute)

Mote 4A

Mote 6A Sensing Index
Mote 6A Control Index
Mote 6A Routing/Spatial Index
(relative and/or absolute)

Mote 6A

Mote ...A Sensing Index
Mote ...A Control Index
Mote ...A Routing/Spatial Index
(relative and/or absolute)

Mote ...A

Mote MA Sensing Index
Mote MA Control Index
Mote MA Routing/Spatial Index
(relative and/or absolute)

Mote MA

Mote 2A Sensing Index
Mote 2A Control Index
Mote 2A Routing/Spatial Index
(relative and/or absolute)

Mote 2A

Mote 3A Sensing Index
Mote 3A Control Index
Mote 3A Routing/Spatial Index
(relative and/or absolute)

Mote 3A

Mote 5A Sensing Index
Mote 5A Control Index
Mote 5A Routing/Spatial Index
(relative and/or absolute)

Mote 5A

Mote 1A Sensing Index
Mote 1A Control Index
Mote 1A Routing/Spatial Index
(relative and/or absolute)

Mote 1A

MULTI-MOTE INDEX ENTRY FOR MOTE ADDRESS 1A CONTENT INDEXES

MOTE 1A: SENSING INDEX

Light Device	Light Device Information Available	Query Command Format	Output Format	
Electrical/ Magnetic Device	Electrical/ Magnetic Device Information Available	Query Command Format	Output Format	
Inertial Device	Inertial Device Information Available	Query Command Format	Output Format	
Antenna	Antenna Information Available	Query Command Format	Output Format	

MOTE 1A: CONTROL INDEX

Light Sensor	Light Device Commands Available	Control Command Format	Feedback Format	
Electrical/ Magnetic Device	Electrical/ Magnetic Device Commands Available	Control Command Format	Feedback Format	
Inertial Device	Inertial Device Commands Available	Control Command Format	Feedback Format	
Antenna	Antenna Commands Available	Control Command Format	Feedback Format	

MOTE 1A: ROUTING/SPATIAL INDEX

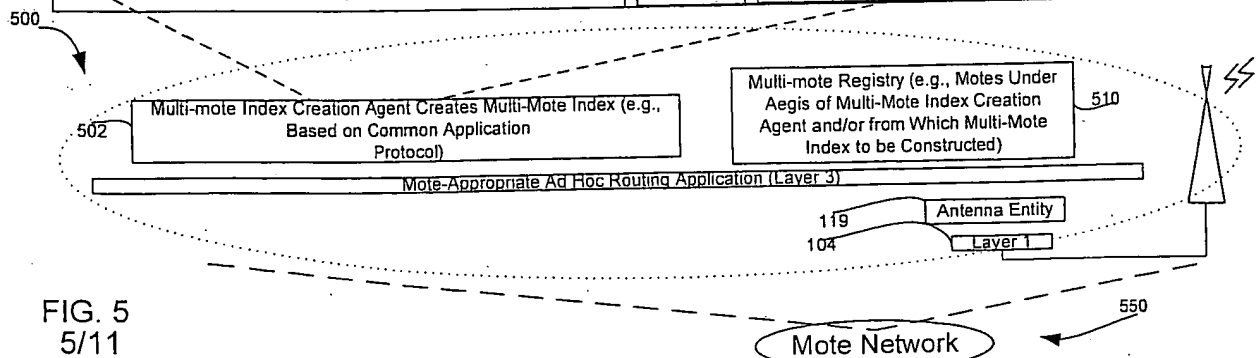| Mote-Network Address 2A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 3A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

MULTI-MOTE INDEX ENTRY FOR MOTE ADDRESS 3A CONTENT INDEXES

504

MOTE 3A: SENSING INDEX

Pressure Device	Pressure Device Information Available	Query Command Format	Output Format	
Temp. Device	Temp. Device Information Available	Query Command Format	Output Format	
Volume Device	Volume Device Information Available	Query Command Format	Output Format	
Antenna	Antenna Information Available	Query Command Format	Output Format	

MOTE 3A: CONTROL INDEX

Pressure Device	Pressure Device Commands Available	Control Command Format	Feedback Format	
Temp. Device	Temp. Device Commands Available	Control Command Format	Feedback Format	
Volume Device	Volume Device Commands Available	Control Command Format	Feedback Format	
Antenna	Antenna Commands Available	Control Command Format	Feedback Format	

MOTE 3A: ROUTING/SPATIAL INDEX

Mote-Network Address 1A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 2A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 6A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

500

Multi-mote Index Creation Agent Creates Multi-Mote Index (e.g., Based on Common Application Protocol) 502

Multi-mote Registry (e.g., Motes Under Aegis of Multi-Mote Index Creation Agent and/or from Which Multi-Mote Index to be Constructed) 510

Mote-Appropriate Ad Hoc Routing Application (Layer 3)

Antenna Entity

119
104

Layer 1

55

550

Mote Network

FIG. 5
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MULTI-MOTE CONTENT INDEX ENTRY FOR MOTE ADDRESS 1A CONTENT INDEXES

MOTE 1A: SENSING INDEX

Light Device	Light Device Information Available	Query Command Format	Output Format
Electrical/ Magnetic Device	Electrical/ Magnetic Device Information Available	Query Command Format	Output Format
Inertial Device	Inertial Device Information Available	Query Command Format	Output Format
Antenna	Antenna Information Available	Query Command Format	Output Format

MOTE 1A: CONTROL INDEX

Light Sensor	Light Device Commands Available	Control Command Format	Feedback Format
Electrical/ Magnetic Device	Electrical/ Magnetic Device Commands Available	Control Command Format	Feedback Format
Inertial Device	Inertial Device Commands Available	Control Command Format	Feedback Format
Antenna	Antenna Commands Available	Control Command Format	Feedback Format

MOTE 1A: ROUTING/SPATIAL INDEX

Mote-Network Address 2A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 3A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

MULTI-MOTE CONTENT INDEX ENTRY FOR MOTE ADDRESS 3A CONTENT INDEXES

504

MOTE 3A: SENSING INDEX

Pressure Device	Pressure Device Information Available	Query Command Format	Output Format
Temp. Device	Temp. Device Information Available	Query Command Format	Output Format
Volume Device	Volume Device Information Available	Query Command Format	Output Format
Antenna	Antenna Information Available	Query Command Format	Output Format

MOTE 3A: CONTROL INDEX

Pressure Device	Pressure Device Commands Available	Control Command Format	Feedback Format
Temp. Device	Temp. Device Commands Available	Control Command Format	Feedback Format
Volume Device	Volume Device Commands Available	Control Command Format	Feedback Format
Antenna	Antenna Commands Available	Control Command Format	Feedback Format

MOTE 3A: ROUTING/SPATIAL INDEX

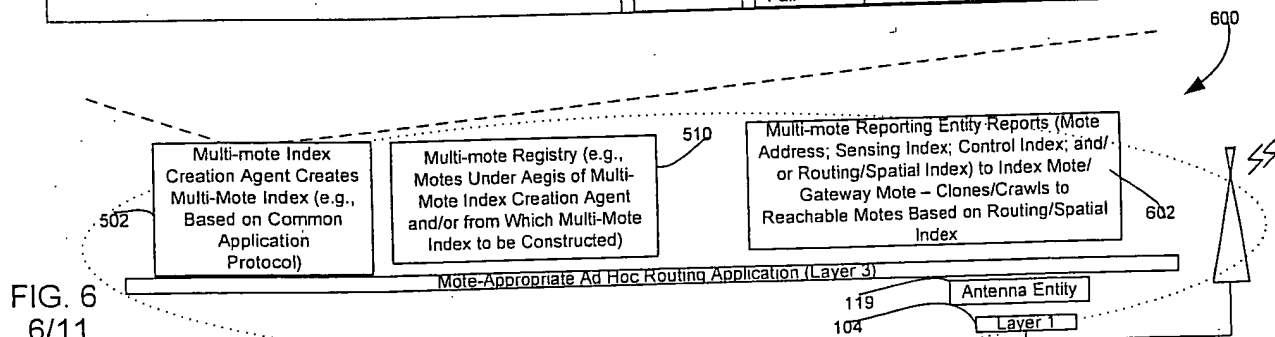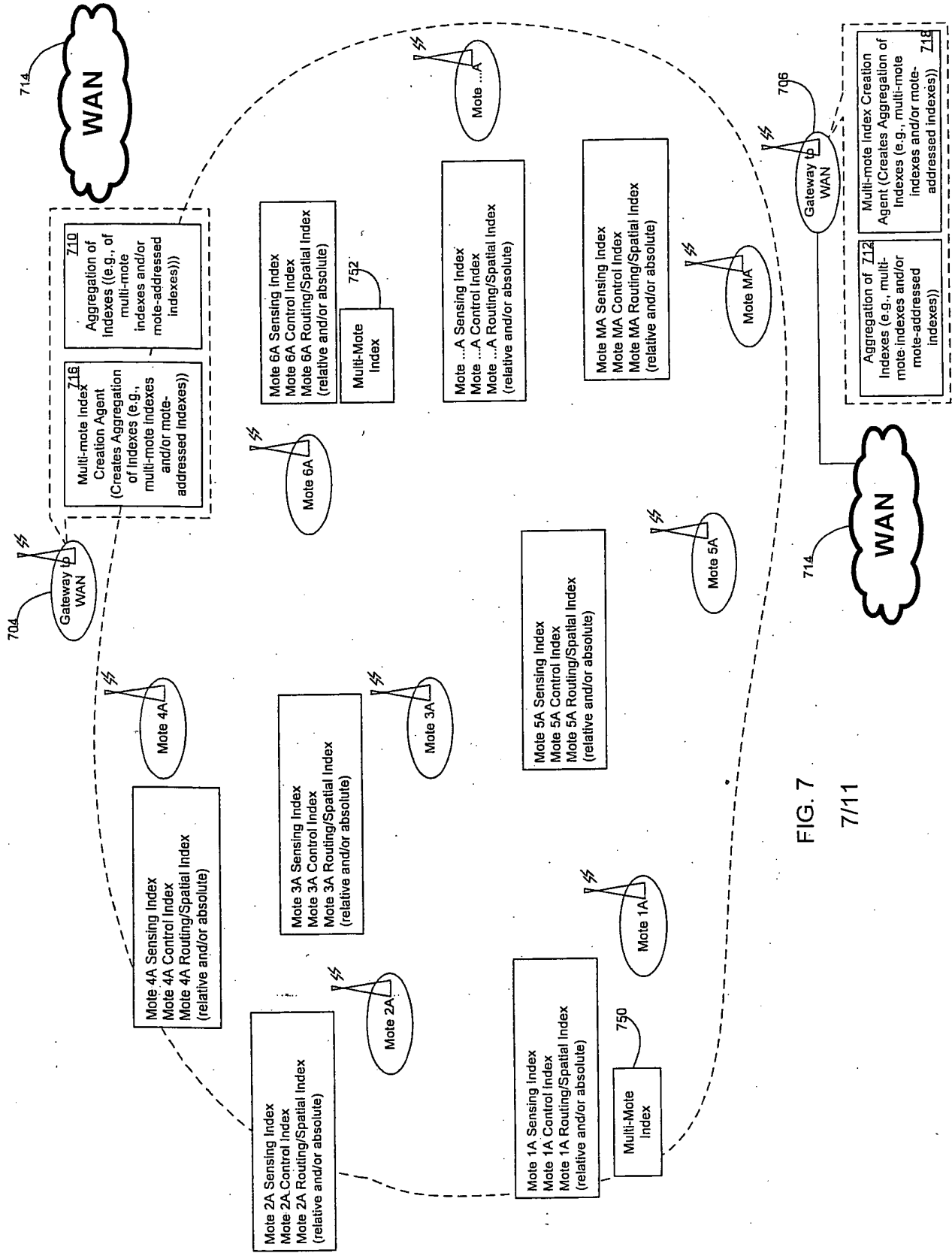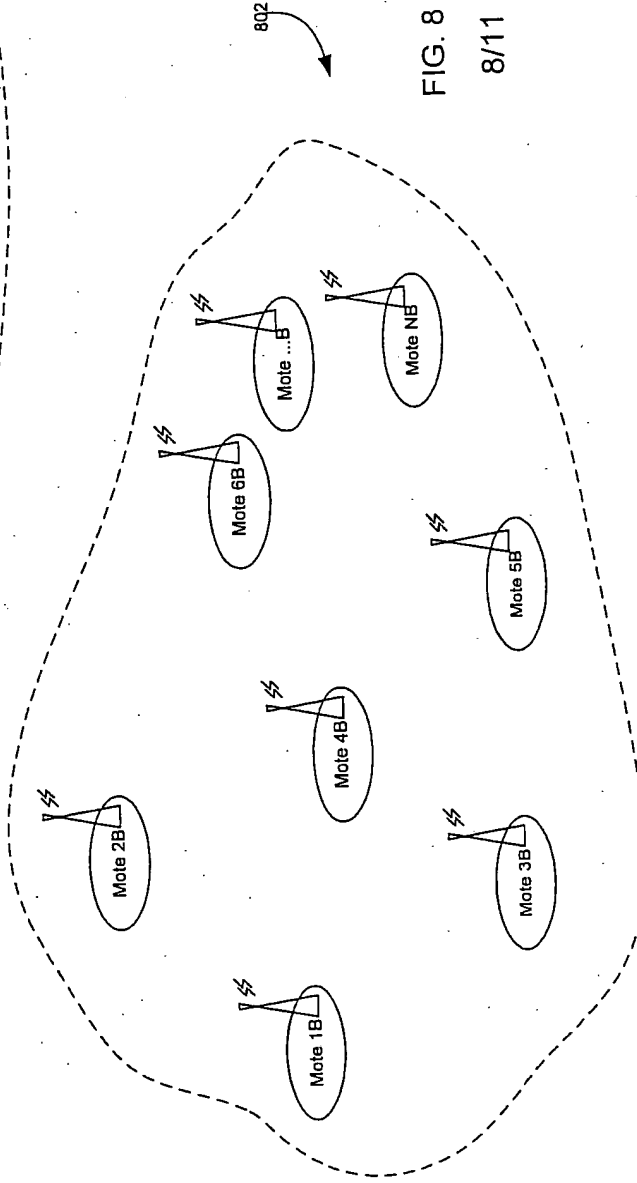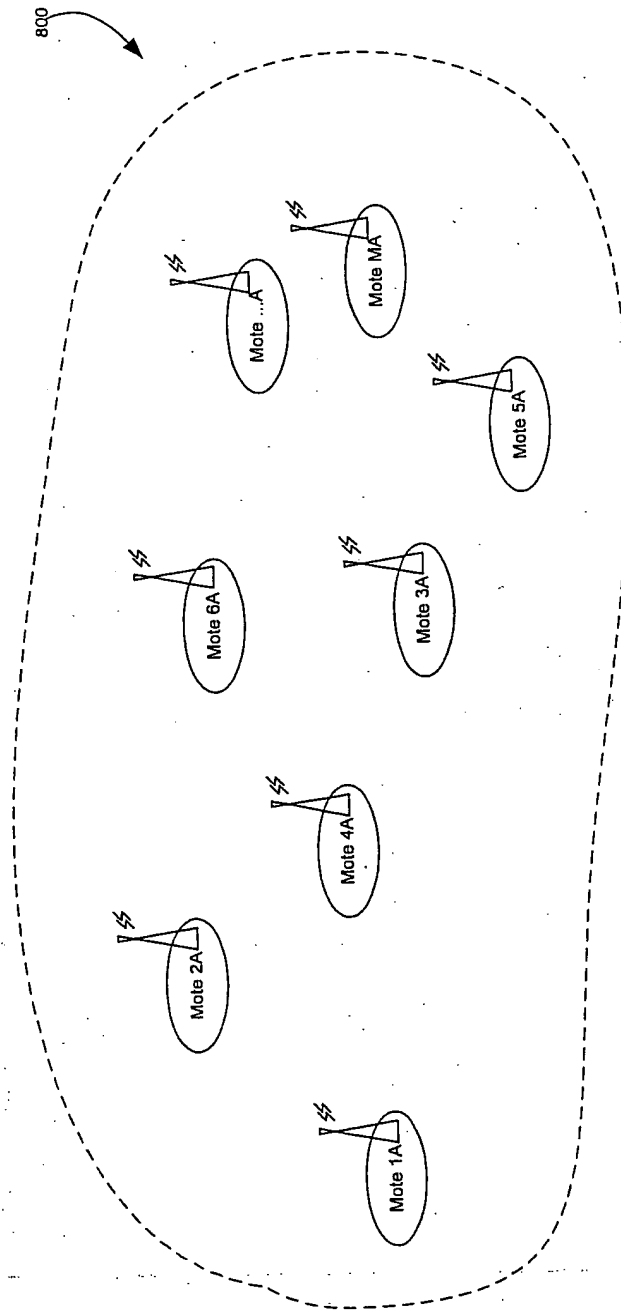|			
Mote-Network Address 1A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 2A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 6A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

600

Multi-mote Index Creation Agent Creates Multi-Mote Index (e.g., Based on Common Application Protocol) 502	Multi-mote Registry (e.g., Motes Under Aegis of Multi-Mote Index Creation Agent and/or from Which Multi-Mote Index to be Constructed) 510	Multi-mote Reporting Entity Reports (Mote Address; Sensing Index; Control Index; and/or Routing/Spatial Index) to Index Mote/ Gateway Mote – Clones/Crawls to Reachable Motes Based on Routing/Spatial Index 602

Mote-Appropriate Ad Hoc Routing Application (Layer 3)

119

Antenna Entity

104

Layer 1

FIG. 6
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FIG. 7

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FIG. 8

FIG. 9

First-Administered Reporting Entity Reports Aggregation of First-Administered Index(es) to Federated Index Creation Agent

902

910

Aggregation of First-Administered Indexes (e.g., mote-addressed index(es) and/or Multi-Mote Index(es))

716

Multi-mote Index Creation Agent (Creates Aggregation of Indexes (e.g., multi-mote indexes and/or mote-addressed indexes))

Gateway to WAN

704

WAN

990

Mainframe

916

Federated Index (e.g., at least a part of a content index from at least two different network domains)

914

Federated Index Creation Agent

WAN

Second-Administered Reporting Entity Reports Aggregation of Second-Administered Index(es) to Federated Index Creation Agent

912

Aggregation of Second-Administered Indexes (e.g., mote-addressed index(es) and/or Multi-Mote Index(es))

904

718

Multi-mote Index Creation Agent (Creates Aggregation of Indexes (e.g., multi-mote indexes and/or mote-addressed indexes))

Gateway to WAN

706

800

Mote 6A
Mote ...A
Mote MA
Mote 5A
Mote 3A
Mote 4A
Mote 2A
Mote 1A

802

Mote ...B
Mote NB
Mote 2B
Mote 4B
Mote 3B
Mote 1B

WAN

Mainframe

990

Federated Index
(e.g., at least a
part of a content
index from at least
two different
network domains)

916

914

Federated
Index
Creation
Agent

WAN

Gateway to
WAN

704

Mote ...A

Mote MA

Mote 5A

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Multi-mote
Index(es)

Mote 3A

Mote 6A

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Mote-
addressed
Index(es)

Mote 4A

Reporting
Entity/
Multi-mote
Index(es)

Mote 2A

Mote 1A

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Mote-
addressed
Index(es)

800

Mote ...B

Mote NB

Reporting
Entity/
Mote-
addressed
Index(es)

706

Reporting
Entity/
Multi-mote
Index(es)

Gateway to
WAN

Mote 6B

Mote 5B

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Mote-
addressed
Index(es)

Mote 4B

Mote 2B

Reporting
Entity/
Mote-
addressed
Index(es)

Mote 3B

Mote 1B

Reporting
Entity/
Mote-
addressed
Index(es)

Reporting
Entity/
Multi-mote
Index(es)

Reporting
Entity/
Mote-
addressed
Index(es)

802

FIG.
10

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Federated Mote Index for First-Administered Set of Motes and Second-Administered Set of Motes	
AGGREGATION OF CONTENT INDEXES FOR MOTE ADDRESSES 1A AND 2A OF FIRST-ADMINISTERED SET OF MOTES	AGGREGATION OF CONTENT INDEXES FOR MOTE ADDRESSES 3A AND 4A OF SECOND-ADMINISTERED SET OF MOTES

MOTE 1A OF FIRST-ADMINISTERED SET OF MOTES: SENSING INDEX

Light Device	Light Device Information Available	Query Command Format	Output Format	
Electrical/ Magnetic Device	Electrical/ Magnetic Device Information Available	Query Command Format	Output Format	
Inertial Device	Inertial Device Information Available	Query Command Format	Output Format	
Antenna	Antenna Information Available	Query Command Format	Output Format	

MOTE 3A OF SECOND-ADMINISTERED SET OF MOTES: SENSING INDEX

Pressure Device	Pressure Device Information Available	Query Command Format	Output Format	
Temp. Device	Temp. Device Information Available	Query Command Format	Output Format	
Volume Device	Volume Device Information Available	Query Command Format	Output Format	
Antenna	Antenna Information Available	Query Command Format	Output Format	

MOTE 2A OF FIRST-ADMINISTERED SET OF MOTES: CONTROL INDEX

Light Sensor	Light Device Commands Available	Control Command Format	Feedback Format	
Electrical/ Magnetic Device	Electrical/ Magnetic Device Commands Available	Control Command Format	Feedback Format	
Inertial Device	Inertial Device Commands Available	Control Command Format	Feedback Format	
Antenna	Antenna Commands Available	Control Command Format	Feedback Format	

MOTE 4A OF SECOND-ADMINISTERED SET OF MOTES: CONTROL INDEX

Pressure Device	Pressure Device Commands Available	Control Command Format	Feedback Format	
Temp. Device	Temp. Device Commands Available	Control Command Format	Feedback Format	
Volume Device	Volume Device Commands Available	Control Command Format	Feedback Format	
Antenna	Antenna Commands Available	Control Command Format	Feedback Format	

MOTE 2A OF FIRST-ADMINISTERED SET OF MOTES: ROUTING /SPATIAL INDEX

Mote-Network Address 2A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 3A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

MOTE 4A OF SECOND-ADMINISTERED SET OF MOTES: ROUTING /SPATIAL INDEX

Mote-Network Address 1A	Comm. Link Quality of Service: Good	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 2A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 5A	Comm. Link Quality of Service: Poor	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)
Mote-Network Address 6A	Comm. Link Quality of Service: Fair	Absolute Coordinates: Long Lat. (e.g., GPS)	Relative Coordinates (e.g., 2-d or 3-d relative to mote 1A location)

FIG.
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